



M74HC245

OCTAL BUS TRANSCEIVER WITH 3 STATE OUTPUTS (NON INVERTED)

- HIGH SPEED:
 $t_{PD} = 10\text{ns}$ (TYP.) at $V_{CC} = 6\text{V}$
- LOW POWER DISSIPATION:
 $I_{CC} = 4\mu\text{A}$ (MAX.) at $T_A=25^\circ\text{C}$
- HIGH NOISE IMMUNITY:
 $V_{NIH} = V_{NIL} = 28\% V_{CC}$ (MIN.)
- SYMMETRICAL OUTPUT IMPEDANCE:
 $|I_{OH}| = I_{OL} = 6\text{mA}$ (MIN)
- BALANCED PROPAGATION DELAYS:
 $t_{PLH} \cong t_{PHL}$
- WIDE OPERATING VOLTAGE RANGE:
 V_{CC} (OPR) = 2V to 6V
- PIN AND FUNCTION COMPATIBLE WITH 74 SERIES 245



ORDER CODES

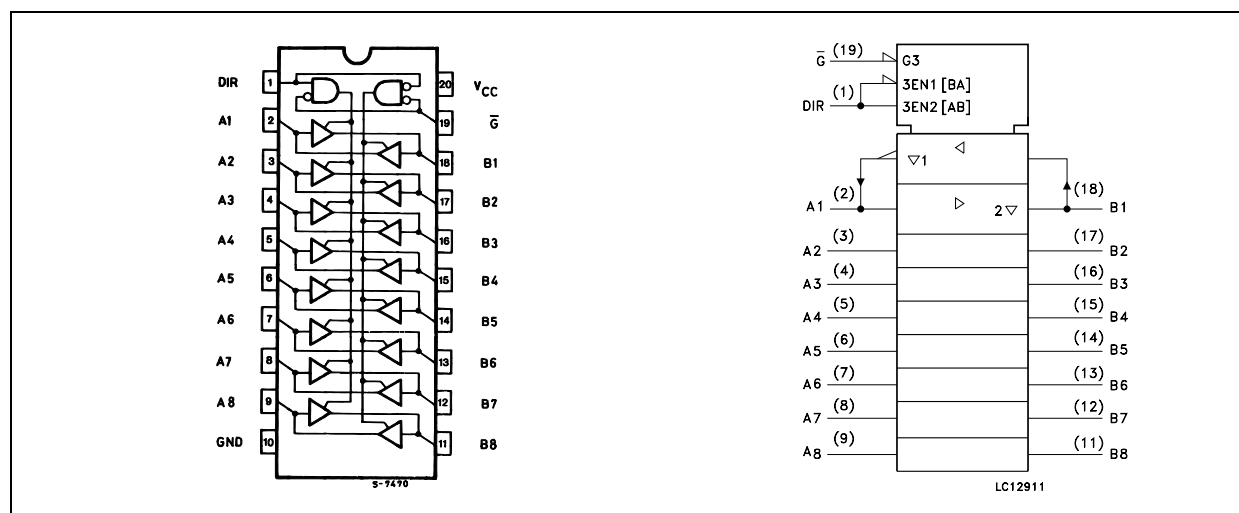
| PACKAGE | TUBE | T & R |
|---------|-------------|----------------|
| DIP | M74HC245B1R | |
| SOP | M74HC245M1R | M74HC245RM13TR |
| TSSOP | | M74HC245TTR |

DESCRIPTION

The M74HC245 is an advanced high-speed CMOS OCTAL BUS TRANSCEIVER (3-STATE) fabricated with silicon gate C²MOS technology. This IC is intended for two-way asynchronous communication between data buses, and the direction of data transmission is determined by DIR input. The enable input G can be used to

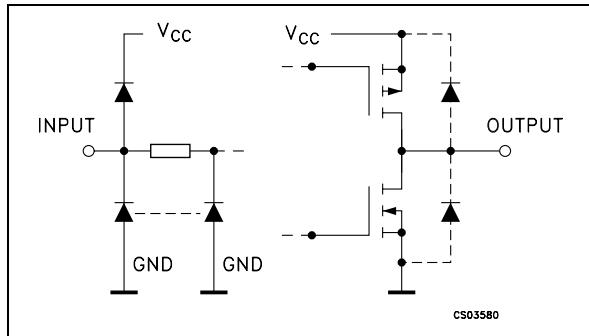
disable the device so that the buses are effectively isolated. All inputs are equipped with protection circuits against static discharge and transient excess voltage. All floating bus terminals during High Z State must be held HIGH or LOW.

PIN CONNECTION AND IEC LOGIC SYMBOLS



M74HC245

INPUT AND OUTPUT EQUIVALENT CIRCUIT



PIN DESCRIPTION

| PIN No | SYMBOL | NAME AND FUNCTION |
|--------------------------------|-----------------|-------------------------|
| 1 | DIR | Directional Control |
| 2, 3, 4, 5, 6, 7, 8, 9 | A1 to A8 | Data Inputs/Outputs |
| 18, 17, 16, 15, 14, 13, 12, 11 | B1 to B8 | Data Inputs/Outputs |
| 19 | G | Output Enable Input |
| 10 | GND | Ground (0V) |
| 20 | V _{CC} | Positive Supply Voltage |

TRUTH TABLE

| INPUTS | | FUNCTION | | OUTPUT |
|----------------|-----|----------|--------|----------------|
| \overline{G} | DIR | A BUS | B BUS | Y _n |
| L | L | OUTPUT | INPUT | A = B |
| L | H | INPUT | OUTPUT | B = A |
| H | X | Z | Z | Z |

X : Don't Care
Z : High Impedance

ABSOLUTE MAXIMUM RATINGS

| Symbol | Parameter | Value | Unit |
|-------------------------------------|--------------------------------------|-------------------------------|------|
| V _{CC} | Supply Voltage | -0.5 to +7 | V |
| V _I | DC Input Voltage | -0.5 to V _{CC} + 0.5 | V |
| V _O | DC Output Voltage | -0.5 to V _{CC} + 0.5 | V |
| I _{IK} | DC Input Diode Current | ± 20 | mA |
| I _{OK} | DC Output Diode Current | ± 20 | mA |
| I _O | DC Output Current | ± 35 | mA |
| I _{CC} or I _{GND} | DC V _{CC} or Ground Current | ± 70 | mA |
| P _D | Power Dissipation | 500(*) | mW |
| T _{stg} | Storage Temperature | -65 to +150 | °C |
| T _L | Lead Temperature (10 sec) | 300 | °C |

Absolute Maximum Ratings are those values beyond which damage to the device may occur. Functional operation under these conditions is not implied

(*) 500mW at 65 °C; derate to 300mW by 10mW/°C from 65°C to 85°C

RECOMMENDED OPERATING CONDITIONS

| Symbol | Parameter | Value | Unit | |
|---------------------------------|--------------------------|------------------------|-----------|----|
| V _{CC} | Supply Voltage | 2 to 6 | V | |
| V _I | Input Voltage | 0 to V _{CC} | V | |
| V _O | Output Voltage | 0 to V _{CC} | V | |
| T _{op} | Operating Temperature | -55 to 125 | °C | |
| t _r , t _f | Input Rise and Fall Time | V _{CC} = 2.0V | 0 to 1000 | ns |
| | | V _{CC} = 4.5V | 0 to 500 | ns |
| | | V _{CC} = 6.0V | 0 to 400 | ns |

DC SPECIFICATIONS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | |
|-----------------|---------------------------------------|------------------------|--|-----------------------|------|-------|-------------|------|--------------|------|------|
| | | V _{CC} (V) | | T _A = 25°C | | | -40 to 85°C | | -55 to 125°C | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. |
| V _{IH} | High Level Input Voltage | 2.0 | | 1.5 | | | 1.5 | | 1.5 | | V |
| | | 4.5 | | 3.15 | | | 3.15 | | 3.15 | | |
| | | 6.0 | | 4.2 | | | 4.2 | | 4.2 | | |
| V _{IL} | Low Level Input Voltage | 2.0 | | | | 0.5 | | 0.5 | | 0.5 | V |
| | | 4.5 | | | | 1.35 | | 1.35 | | 1.35 | |
| | | 6.0 | | | | 1.8 | | 1.8 | | 1.8 | |
| V _{OH} | High Level Output Voltage | 2.0 | I _O =-20 μA | 1.9 | 2.0 | | 1.9 | | 1.9 | | V |
| | | 4.5 | I _O =-20 μA | 4.4 | 4.5 | | 4.4 | | 4.4 | | |
| | | 6.0 | I _O =-20 μA | 5.9 | 6.0 | | 5.9 | | 5.9 | | |
| | | 4.5 | I _O =-6.0 mA | 4.18 | 4.31 | | 4.13 | | 4.10 | | |
| | | 6.0 | I _O =-7.8 mA | 5.68 | 5.8 | | 5.63 | | 5.60 | | |
| V _{OL} | Low Level Output Voltage | 2.0 | I _O =20 μA | | 0.0 | 0.1 | | 0.1 | | 0.1 | V |
| | | 4.5 | I _O =20 μA | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | 6.0 | I _O =20 μA | | 0.0 | 0.1 | | 0.1 | | 0.1 | |
| | | 4.5 | I _O =6.0 mA | | 0.17 | 0.26 | | 0.33 | | 0.40 | |
| | | 6.0 | I _O =7.8 mA | | 0.18 | 0.26 | | 0.33 | | 0.40 | |
| I _I | Input Leakage Current | 6.0 | V _I = V _{CC} or GND | | | ± 0.1 | | ± 1 | | ± 1 | μA |
| I _{OZ} | High Impedance Output Leakage Current | 6.0 | V _I = V _{IH} or V _{IL} V _O = V _{CC} or GND | | | ± 0.5 | | ± 5 | | ± 10 | μA |
| I _{CC} | Quiescent Supply Current | 6.0 | V _I = V _{CC} or GND | | | 4 | | 40 | | 80 | μA |

M74HC245

AC ELECTRICAL CHARACTERISTICS ($C_L = 50$ pF, Input $t_r = t_f = 6$ ns)

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | | |
|---------------------|------------------------------------|-----------------|---------------|--------------------------|------|------|-----------------------------|------|------------------------------|------|------|----|
| | | V_{CC} (V) | C_L (pF) | $T_A = 25^\circ\text{C}$ | | | -40 to 85°C | | -55 to 125°C | | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. | |
| t_{TLH} t_{THL} | Output Transition Time | 2.0 | 50 | | 25 | 60 | | 75 | | 90 | ns | |
| | | 4.5 | | | 7 | 12 | | 19 | | 18 | | |
| | | 6.0 | | | 6 | 10 | | 13 | | 15 | | |
| t_{PLH} t_{PHL} | Propagation Delay Time | 2.0 | 50 | | 33 | 90 | | 115 | | 135 | ns | |
| | | 4.5 | | | 12 | 18 | | 23 | | 27 | | |
| | | 6.0 | | | 10 | 15 | | 20 | | 23 | | |
| | | 2.0 | 150 | | 48 | 120 | | 150 | | 180 | ns | |
| | | 4.5 | | | 16 | 24 | | 30 | | 36 | | |
| | | 6.0 | | | 14 | 20 | | 26 | | 31 | | |
| t_{PZL} t_{PZH} | High Impedance Output Enable Time | 2.0 | 50 | $R_L = 1\text{ K}\Omega$ | | 48 | 150 | | 190 | | 225 | ns |
| | | 4.5 | | | | 16 | 30 | | 38 | | 45 | |
| | | 6.0 | | | | 14 | 26 | | 32 | | 38 | |
| | | 2.0 | 150 | $R_L = 1\text{ K}\Omega$ | | 63 | 180 | | 225 | | 270 | ns |
| | | 4.5 | | | | 21 | 36 | | 45 | | 54 | |
| | | 6.0 | | | | 18 | 31 | | 38 | | 46 | |
| t_{PLZ} t_{PHZ} | High Impedance Output Disable Time | 2.0 | 50 | $R_L = 1\text{ K}\Omega$ | | 37 | 150 | | 190 | | 225 | ns |
| | | 4.5 | | | | 17 | 30 | | 38 | | 45 | |
| | | 6.0 | | | | 15 | 26 | | 32 | | 38 | |

CAPACITIVE CHARACTERISTICS

| Symbol | Parameter | Test Condition | | Value | | | | | | Unit | | |
|-------------|--|-----------------|--|--------------------------|------|------|-----------------------------|------|------------------------------|------|------|----|
| | | V_{CC} (V) | | $T_A = 25^\circ\text{C}$ | | | -40 to 85°C | | -55 to 125°C | | | |
| | | | | Min. | Typ. | Max. | Min. | Max. | Min. | | Max. | |
| C_{IN} | Input Capacitance | | | DIR, \bar{G} | | 5 | 10 | | 10 | | 10 | pF |
| $C_{I/OUT}$ | Output Capacitance | | | An, Bn | | 13 | | | | | | pF |
| C_{PD} | Power Dissipation Capacitance (note 1) | | | | | 39 | | | | | | pF |

1) C_{PD} is defined as the value of the IC's internal equivalent capacitance which is calculated from the operating current consumption without load. (Refer to Test Circuit). Average operating current can be obtained by the following equation. $I_{CC(oper)} = C_{PD} \times V_{CC} \times f_{IN} + I_{CC}/8$ (per circuit)

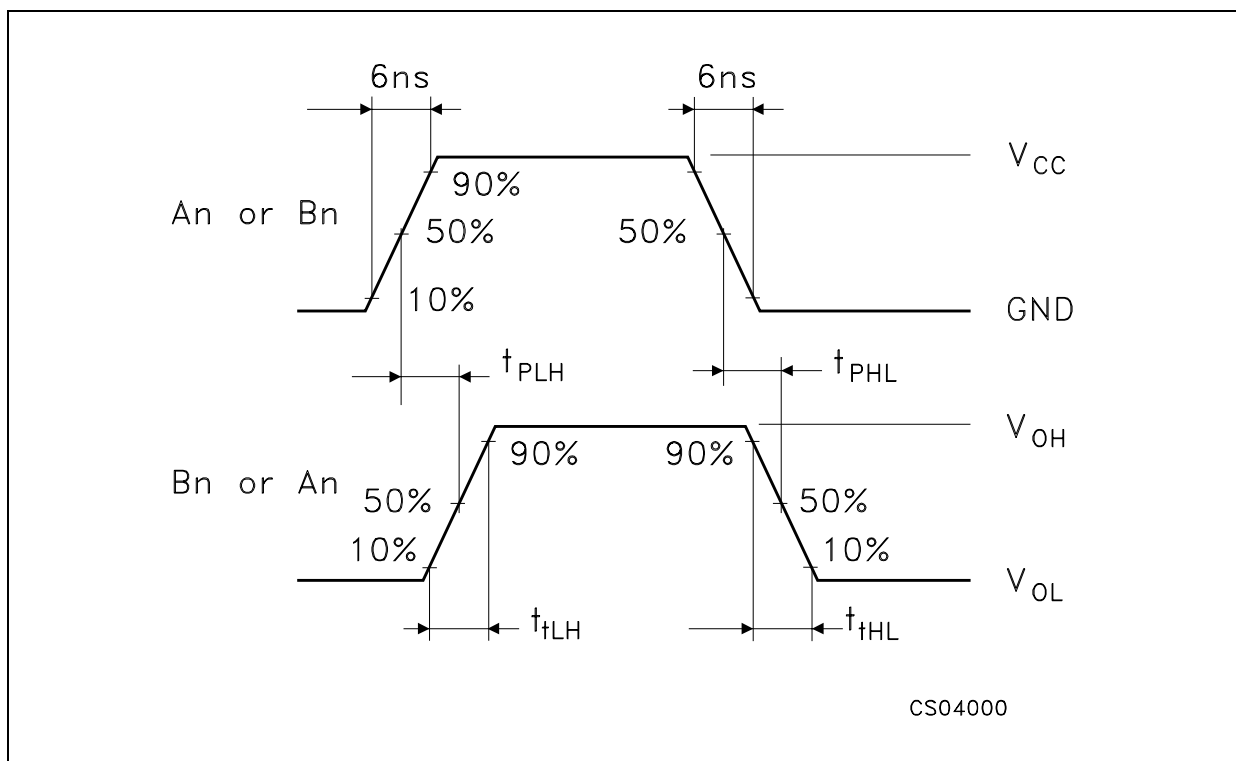
TEST CIRCUIT



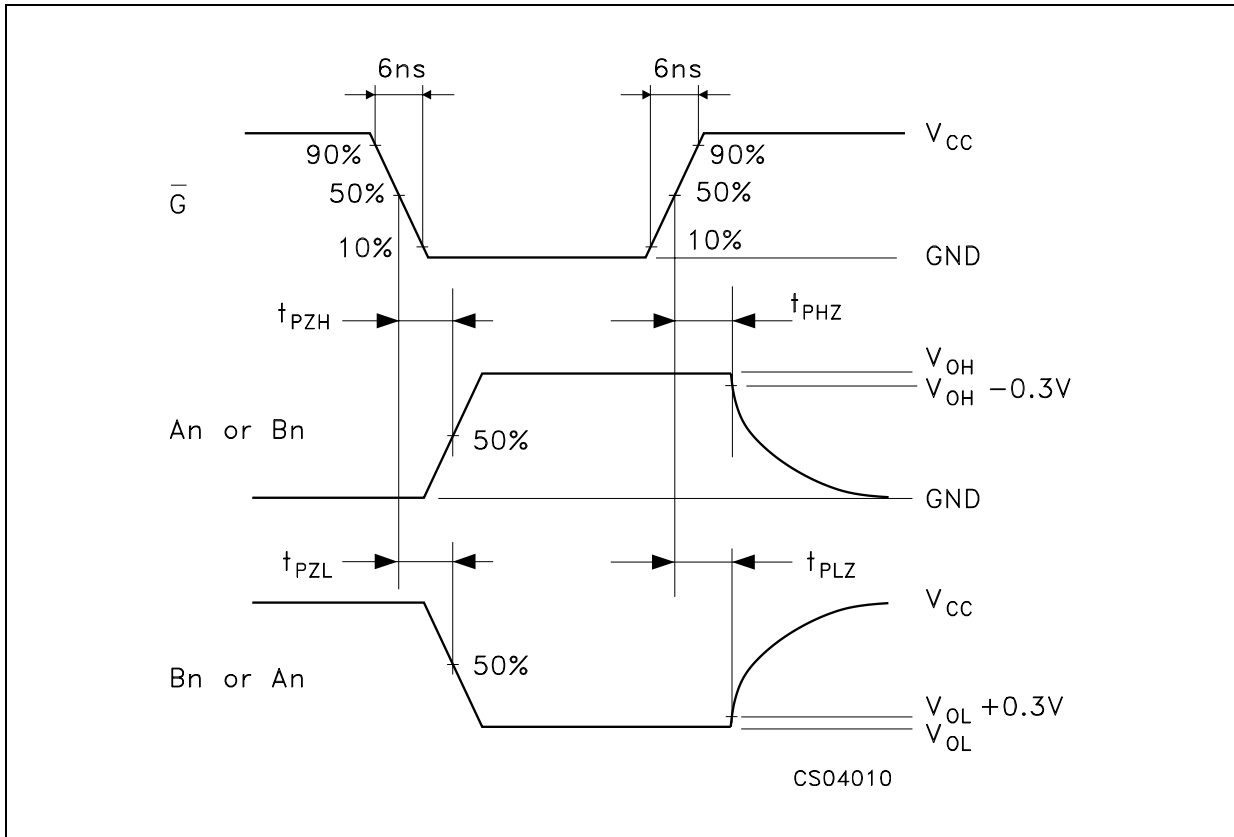
| TEST | SWITCH |
|-----------------------|----------|
| t_{PLH} , t_{PHL} | Open |
| t_{PZL} , t_{PLZ} | V_{CC} |
| t_{PZH} , t_{PHZ} | GND |

C_L = 50pF/150pF or equivalent (includes jig and probe capacitance)
 R_1 = 1K Ω or equivalent
 R_T = Z_{OUT} of pulse generator (typically 50 Ω)

WAVEFORM 1: PROPAGATION DELAY TIME (f=1MHz; 50% duty cycle)

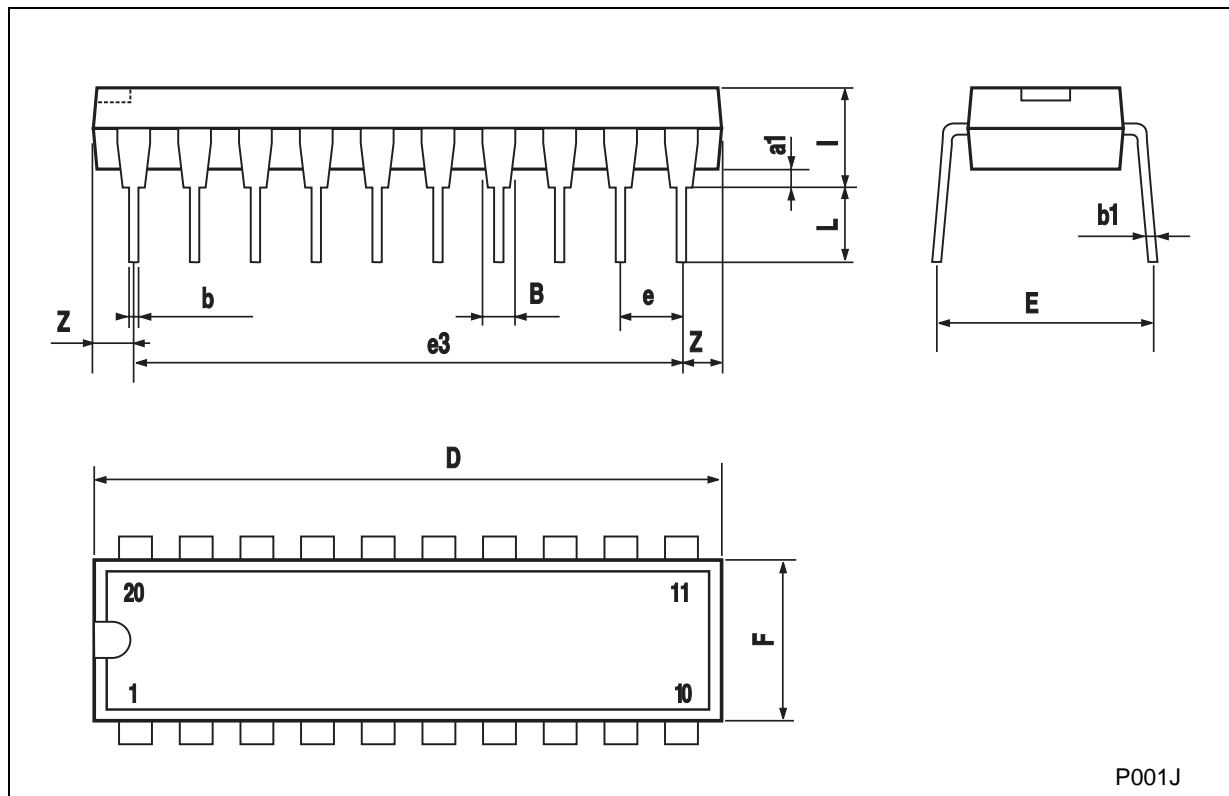


WAVEFORM 2 : OUTPUT ENABLE AND DISABLE TIME (f=1MHz; 50% duty cycle)



Plastic DIP-20 (0.25) MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|-------|-------|------|-------|-------|-------|
| | MIN. | TYP | MAX. | MIN. | TYP. | MAX. |
| a1 | 0.254 | | | 0.010 | | |
| B | 1.39 | | 1.65 | 0.055 | | 0.065 |
| b | | 0.45 | | | 0.018 | |
| b1 | | 0.25 | | | 0.010 | |
| D | | | 25.4 | | | 1.000 |
| E | | 8.5 | | | 0.335 | |
| e | | 2.54 | | | 0.100 | |
| e3 | | 22.86 | | | 0.900 | |
| F | | | 7.1 | | | 0.280 |
| I | | | 3.93 | | | 0.155 |
| L | | 3.3 | | | 0.130 | |
| Z | | | 1.34 | | | 0.053 |



SO-20 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------------|-------|-------|-------|-------|-------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 2.65 | | | 0.104 |
| a1 | 0.1 | | 0.2 | 0.004 | | 0.008 |
| a2 | | | 2.45 | | | 0.096 |
| b | 0.35 | | 0.49 | 0.014 | | 0.019 |
| b1 | 0.23 | | 0.32 | 0.009 | | 0.012 |
| C | | 0.5 | | | 0.020 | |
| c1 | 45° (typ.) | | | | | |
| D | 12.60 | | 13.00 | 0.496 | | 0.512 |
| E | 10.00 | | 10.65 | 0.393 | | 0.419 |
| e | | 1.27 | | | 0.050 | |
| e3 | | 11.43 | | | 0.450 | |
| F | 7.40 | | 7.60 | 0.291 | | 0.300 |
| L | 0.50 | | 1.27 | 0.020 | | 0.050 |
| M | | | 0.75 | | | 0.029 |
| S | 8° (max.) | | | | | |



PO13L

TSSOP20 MECHANICAL DATA

| DIM. | mm. | | | inch | | |
|------|------|----------|------|-------|------------|--------|
| | MIN. | TYP. | MAX. | MIN. | TYP. | MAX. |
| A | | | 1.2 | | | 0.047 |
| A1 | 0.05 | | 0.15 | 0.002 | 0.004 | 0.006 |
| A2 | 0.8 | 1 | 1.05 | 0.031 | 0.039 | 0.041 |
| b | 0.19 | | 0.30 | 0.007 | | 0.012 |
| c | 0.09 | | 0.20 | 0.004 | | 0.0089 |
| D | 6.4 | 6.5 | 6.6 | 0.252 | 0.256 | 0.260 |
| E | 6.2 | 6.4 | 6.6 | 0.244 | 0.252 | 0.260 |
| E1 | 4.3 | 4.4 | 4.48 | 0.169 | 0.173 | 0.176 |
| e | | 0.65 BSC | | | 0.0256 BSC | |
| K | 0° | | 8° | 0° | | 8° |
| L | 0.45 | 0.60 | 0.75 | 0.018 | 0.024 | 0.030 |



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